BUREAU OF ENVIRONMENTAL REMEDIATION/REMEDIAL SECTION GUIDANCE

SCOPE OF WORK (SOW) FOR A COMPREHENSIVE INVESTIGATION (CI)/CORRECTIVE ACTION STUDY (CAS)

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The Comprehensive Investigation and Corrective Action Study (CI/CAS) Scope of Work (SOW) provides an outline that should be employed to characterize the nature and extent of risks posed by contaminated sites and to evaluate potential remedial options. This SOW is a flexible process that can be tailored to specific characteristics and needs of individual sites.

The goals of the Comprehensive Investigation are to determine the nature and extent of environmental contamination at the site, assess potential human health and environmental risks posed by the site, and develop a preliminary list of remedial action objectives and corresponding potential corrective action alternatives that will be evaluated in detail during the subsequent Corrective Action Study process. The primary objectives of the Comprehensive Investigation are to:

1) Identify and characterize all potential source areas, including identifying all chemicals of concern, determining the mechanisms of release, estimating the quantities of release, and determining whether these releases are ongoing or inactive;

2) Delineate and characterize the full lateral and vertical extent of contamination for each of the impacted environmental media at the site;

3) Characterize the environmental setting, including regional and local geology, hydrogeology, and hydrology; particularly as those site physical characteristics may pertain to contaminant transport and fate mechanisms for the site or may affect the evaluation, selection and design of cleanup alternatives for the site;

4) Characterize the physicochemical properties of the contaminants, their mobility and persistence in the environment, and their important fate and transport mechanisms as they relate to the site physical characteristics;

5) Identify human and environmental targets that may be threatened or affected by the site;

6) Perform a quantitative human health risk assessment to determine whether and the extent to which the site requires remediation;

7) Perform bench or pilot treatability tests as necessary to support the development of potential corrective action alternatives; and,

8) Develop a preliminary list of remedial action objectives and corresponding potential corrective action alternatives.

The Corrective Action Study (CAS) provides an objective and standardized process for evaluating, comparing, and contrasting potential corrective action alternatives. The primary objectives of the CAS are described as follows:

1) to evaluate the feasibility, effectiveness, and cost of at least two (2) potential remedial actions based on the findings of the Comprehensive Investigation (CI), and to compare and contrast those alternatives to each other and the "no action" alternative;

2) to recommend and justify a specific corrective action for the site; and

3) to determine the health and environmental effects of the remedial action.

This Scope of Work outlines activities necessary to satisfy these objectives. A CI/CAS Work Plan describing in detail all activities proposed to satisfy the CI/CAS objectives shall be developed and submitted to KDHE for approval. The CI/CAS Work Plan must include an implementation schedule defining the dates for initiating and completing the various tasks associated with this Scope of Work and for submitting work plans and reports defined as deliverable documents within the Consent Order. In addition, the CI/CAS Work Plan must include the following site-specific supporting documents: 1) quality assurance project plan; 2) field sampling plan; and 3) health and safety plan. A quality assurance project plan describes the policy, organization, functional activities, and quality assurance and quality control protocols necessary to achieve the data quality objectives dictated by the intended use of the data. A field sampling plan provides the guidance for all field work by defining in detail the sampling and data-gathering methods to be used on a project. The field sampling plan should be written so that a field sampling team unfamiliar with the site would be able to gather the samples and field information required. A health and safety plan prepared to support the field effort must conform to the firm's or agency's health and safety program which must, in turn, be in compliance with requirements of the Occupational Safety and Health Administration.

The Scope of Work for the performance of a CI/CAS shall, at a minimum, include the following components:

1.0 HISTORICAL EVALUATION AND SITE DESCRIPTION

A description of the site location should be generated, including a legal description of the site, facility address, and facility layout, as appropriate. An ownership history for the source facility and the ownership status of other affected properties should be documented. A description of all past and present activities or operations conducted at the site must be included in the CI Report including: the nature of business operations conducted at the site, chemicals used at the facility, wastes generated by facility operations, chemical and waste disposal methods, and records or descriptions of all known spills or leaks. Environmental permits issued relative to past or present business operations should be identified. Descriptions of any previous environmental investigations

conducted at the site and summaries of the significant findings of those investigations should be included. The historical evaluation and site description component of the Comprehensive Investigation may be excluded if a KDHE-approved Preliminary Investigation was conducted at the site or if sufficient background information about the site has been previously documented and submitted to KDHE.

2.0 STUDY AREA INVESTIGATION

A description of the physical characteristics of the study area must be provided including, but not limited to: geology, soils, hydrogeology, surface water hydrology, and meteorology. Past and present land use on and adjacent to the site must be described. Current city and/or county land use zoning classifications that may affect any potential remedy for the site must be documented. The physical characteristics of the study area should be determined to the extent necessary to facilitate the evaluation of appropriate remedial responses.

3.0 SOURCE CHARACTERIZATION

A detailed description of all field activities completed to identify the source(s), extent, and release mechanisms for environmental contamination and the findings of those activities must be provided. This may include several components: review of facility records; personnel interviews; waste and/or soil sampling; equipment testing (tank, pipeline, or sewer line testing, etc.), geophysical surveys, aerial photograph review, and land elevation surveys, among others.

4.0 NATURE AND EXTENT CHARACTERIZATION

A study to determine the full horizontal and vertical extent of environmental contamination must be performed. Potential media to be investigated include surface and subsurface soils, ground water, surface water, sediment, air, and biota. An evaluation of the significant contaminant fate and transport mechanisms should be performed. This component of the CI may include monitoring well or piezometer installation, soil borings, soil or ground water probing, field and laboratory analyses, geophysical surveys, hydrogeological evaluations, surveying, computer modeling, and biota studies, among others. Analytical data should be collected of appropriate data quality and quantity to support the completion of a Risk Assessment, if one is to be performed, and to support the evaluation of potential remedial alternatives. All data should be validated at the appropriate field or laboratory quality control level to determine whether it is appropriate for its intended use.

5.0 RISK ASSESSMENT (Optional)

Information and environmental data collected and validated as representative of site conditions may be used to qualitatively or quantitatively describe the potential excess human health risk and/or ecological risk posed by the site in the absence of remediation. This Risk Assessment process is used to characterize the risk posed to human health or the environment by environmental conditions at a contaminated site. In lieu of performing a site-specific Risk Assessment to evaluate risk and arrive at cleanup goals for a site, the participating party may elect, with the concurrence of the KDHE project manager, to use the risk-based cleanup goals for soil and ground water under Tier 2 of the Risk-Based Standards for Kansas manual (RSK manual). If KDHE determines that the completion of a quantitative Risk Assessment is appropriate, the participating party may, at their option, perform such risk assessment for submittal to KDHE for approval. Prior to performing the

risk assessment, the participating party must submit a baseline risk assessment work plan that, among other items, provides a site-specific exposure conceptual model, which either graphically illustrates or states the impacted media and all the primary and secondary exposure pathways, lists all contaminants of concern, standard exposure parameters, land use, methodologies for determining reasonable maximum exposure point concentrations, proxy determinations, and other statistical considerations. The quantitative baseline risk assessment should be performed in accordance with "Risk Assessment Guidance for Superfund" EPA/540/1-89/002 and other associated guidance such as "Dermal Exposure Factors Handbook" and OSWER Directive, "Standard Exposure Factors". The work plan must be approved by KDHE prior to commencing the Baseline Risk Assessment. Alternatively, the participating party may elect to have KDHE's contractor perform the Risk Assessment at the party's expense. Coordination with KDHE is required throughout the risk characterization and cleanup goal determination process.

6.0 IDENTIFICATION OF CORRECTIVE ACTION ALTERNATIVES

Information and data generated during the Comprehensive Investigation, including the Risk Assessment, if performed, should be evaluated to develop a preliminary list of remedial action objectives and to identify applicable or relevant and appropriate cleanup standards or cleanup goals. In addition, an initial list of general response actions or potential corrective action alternatives to be evaluated in detail during the Corrective Action Study (CAS) should be developed.

7.0 PILOT TREATABILITY STUDIES/DATA GATHERING

To keep the CI/CAS process on schedule, it may be appropriate to identify and initiate any pilot testing necessary to evaluate corrective action alternatives early in the CI process. Treatability studies are conducted to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the CAS process and to support the subsequent remedial design of the corrective action alternative ultimately selected by KDHE. Treatability investigations also serve to reduce cost and performance uncertainties for treatment alternatives to acceptable levels to permit a more reliable remedy selection process. Examples of treatability data gathering activities that might be performed during the CI include aquifer pumping tests, soil vapor extraction pilot tests, or pilot-scale applications of innovative technologies to evaluate their applicability to site wastes. Pilot treatability studies and other treatability data gathering activities should be completed consistent with a KDHE-approved work plan.

8.0 CI REPORT

Upon completion of all Comprehensive Investigation activities necessary to achieve the objectives of the CI Scope of Work, a Comprehensive Investigation Report must be submitted to KDHE, in a time frame consistent with the implementation schedule in the approved CI Work Plan, for review and approval. The CI Report should include all information and data collected from during the investigation and describe in detail the work performed to accomplish the objectives as set forth within this SOW. The CI Report format shall be consistent with this Scope of Work and include appropriate tables, figures, well logs, laboratory analytical data, references, appendices, etc. to effectively portray the data generated during the investigation and to support any conclusions drawn in the CI Report.

* *Submission of a CAS Work Plan may be necessary if additional data gathering is necessary*

following completion of the CI in order to evaluate potential corrective action alternatives.

9.0 EVALUATION OF CORRECTIVE ACTIONS

The Corrective Action Study is the process through which detailed assessments of at least two plausible corrective action alternatives and the "no action" alternative are performed. The evaluation must include: 1) a description of the contaminants of concern within each environmental media; 2) an identification of all real and potential human and environmental targets and an evaluation of all direct and indirect exposure pathways; 3) a description of the site-specific corrective action goals; 4) treatability studies for corrective actions considered innovative or unproven; and 5) a detailed individual and comparative analysis of each of the proposed corrective actions, and the "no action" alternative, to evaluate their ability to satisfy the following criteria:

a) overall protection of human health and environment;
b) compliance with Federal and State applicable, or relevant and appropriate requirements (ARARs);
c) long-term effectiveness and permanence;
d) reduction of toxicity, mobility and volume of contamination through treatment;
e) short-term effectiveness;
f) implementability;
g) cost; and
h) community acceptance.

For potential corrective action alternatives that would not result in short-term restoration of the site, the evaluation of those alternatives should also address the time frame in which the alternative might reasonably be expected to achieve the corrective action goals for the site.

10.0 RECOMMENDATION OF A CORRECTIVE ACTION

The detailed evaluation of potential corrective action alternatives shall provide the basis for recommending and supporting a specific corrective action or group of corrective actions for the site, which satisfies the requirements as defined in Section 2.0.

11.0 CAS REPORT

The Corrective Action Study Report shall include: 1) a brief summary of the findings of previous environmental investigations, including a risk assessment, if performed; 2) a description of the site-specific corrective action goals; 3) a detailed description of each corrective action alternative evaluated, including the "no action" alternative; 4) a detailed discussion of each corrective action alternative evaluated in the context of satisfying the criteria defined in Section 2.0; 5) a recommendation for corrective action at the site; and 6) an Appendix containing any background information or literature which was used to evaluate each corrective action alternative.

KDHE/BER strongly recommends that any persons performing Comprehensive Investigation and/or Corrective Action Study activities with State of Kansas oversight obtain and familiarize themselves with the following documents. These documents provide guidance for the preparation, implementation, and reporting of CI/CAS activities, and constitute much of the technical basis on which KDHE/BER reviews work plans, reports, and other submittals related to the CI/CAS process. Information on obtaining the EPA documents is available on-line at *http://www.epa.gov/epahome/publications.htm.* Information on the State Cooperative

Program administered by the Remedial Section of the Bureau of Environmental Remediation can be found on-line at the KDHE web site, http://www.kdhe.state.ks.us/ber/remedial/sru.html.

EPA/600/R-98/018 February 1998; "EPA Guidance for Quality Assurance Project Plans (EPA QA/G-5)."

EPA/540/G-89/004 (OSWER Directive9355.3-01) October 1988; "Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA."

EPA/600/R-96/055 August 2000; "Guidance for the Data Quality Objectives Process (EPA QA/G-4)."

EPA/540/1-89/002 December 1989; "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A)."

EPA/540/R-92/003 December 1991; "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)."

"Risk-Based Standards for Kansas (RSK Manual)", March 24, 1999 (available from KDHE/BER).